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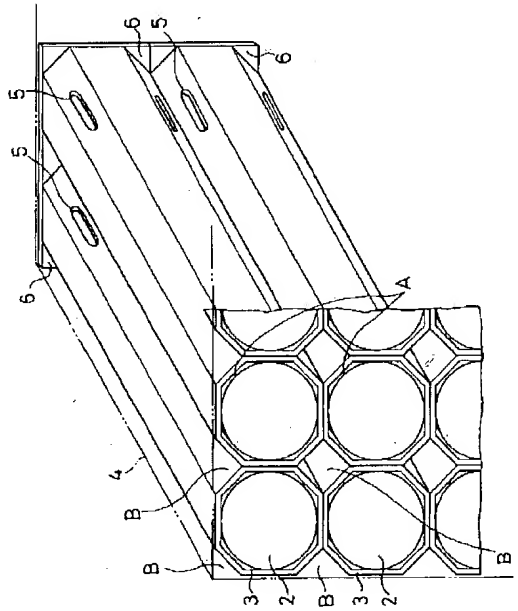
(54)【発明の名称】　蓄電池電源装置

(57)【要約】

【課題】　複数の蓄電池を集積して所定電力量の蓄電池電源装置を構成したときの温度上昇を抑え、温度分布の均一化を図った蓄電池電源装置を提供する。

【解決手段】　円柱状に形成された蓄電池２を８角形筒に形成された筒状ケース３に収容し、筒状ケース３を所望数に連結して蓄電池電源装置１を構成する。蓄電池２と筒状ケース３との間には冷媒流通空間Ａが形成され、筒状ケース３の角部には冷媒流通空間Ｂが形成されるので、ここに冷媒を流通させると、蓄電池２から発散される熱は、接触部分から筒状ケース３に熱伝導すると同時に冷媒により蓄電池２と筒状ケース３とが冷却される。筒状ケース３の冷媒流通経路の下流側に通気孔５を設け、冷媒流通空間Ｂの下流側を閉じておくと、冷媒は通気孔５から筒状ケース３の中に流入するので、下流側の蓄電池２の冷却が促進される。



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【特許請求の範囲】

【請求項1】　単電池もしくは単電池の集合体を所要数集積して所定電力量を得る蓄電池電源装置において、断面外形形状が長さ方向に一定の柱状に形成された前記単電池もしくは単電池の集合体を、その外周面が部分的に内接する筒状体内に収容し、この筒状体を任意方向に連結すると共に、前記筒状体内に形成される空間及び／又は筒状体を相互に連結させたときに生じる空間に冷媒を強制流通させることを特徴とする蓄電池電源装置。

【請求項2】　筒状体の外面に、筒状体を相互に連結させる連結部を形成したことを特徴とする請求項1記載の蓄電池電源装置。

【請求項3】　筒状体の任意位置に、内部と外部とを連通する開口部を形成したことを特徴とする請求項1記載の蓄電池電源装置。

【請求項4】　筒状体が熱伝導性に優れた材料で形成されてなることを特徴とする請求項1記載の蓄電池電源装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、複数の単電池を組み合わせて所定電力量を得る蓄電池電源装置に関し、特に集合体となる蓄電池の温度上昇を抑える放熱構造を備えた蓄電池電源装置に関するものである。

【０００２】

【従来の技術】多数の単電池を接続して所定電圧、所定電力量の蓄電池電源装置を構成するとき、多数個の単電池が密集配置されることになるため、個々の単電池の発熱やジュール熱等により電源装置が温度上昇する。そこで、電池の配列間に空気等の冷媒を流通させて、電池の温度上昇を抑制することは従来から実施されてきた。

【０００３】

【発明が解決しようとする課題】しかし、複数列に配置された電池の間に冷媒を流通させたとき、冷媒流通方向の下流側に位置する電池は、上流側の電池で温度上昇した冷媒により冷却されることになるため冷却効率が低く、下流側の電池の温度は上流側の電池に比べて高くなる。また、集積された中央部に位置する電池ほど周囲の電池からの伝熱を受ける度合いが大きく、温度上昇が激しくなる。

【０００４】このように、集積された電池間の温度格差が大きくなると、電池性能にも格差が生じやすく、充放電制御にも障害をもたらし蓄電池電源装置としての信頼性を低下させることになる。

【０００５】本発明は、上記のごとき放熱性のばらつきに伴う蓄電池電源装置の性能低下を抑制すべく、集積された電池個々の放熱性を向上させる放熱構造を備えた蓄電池電源装置を提供することを目的とする。

【０００６】

【課題を解決するための手段】本発明に係る蓄電池電源装置は、単電池もしくは単電池の集合体を所要数集積して所定電力量を得る蓄電池電源装置において、断面外形形状が長さ方向に一定の柱状に形成された前記単電池もしくは単電池の集合体を、その外周面が部分的に内接する筒状体内に収容し、この筒状体を任意方向に連結すると共に、前記筒状体内に形成される空間及び／又は筒状体を相互に連結させたときに生じる空間に冷媒を強制流通させることを特徴とする。

【０００７】上記筒状体は、相互に連結させる連結部が外面に形成され、任意位置に内部と外部とを連通する開口部が形成され、熱伝導性に優れた材料で形成することができる。

【０００８】上記構成によれば、断面外形形状が長さ方向に一定の柱状に形成された前記単電池もしくは単電池の集合体を、その外周面が部分的に内接する筒状体内に収容し、この筒状体を連結部により任意方向に連結すると、単電池もしくは単電池の集合体と筒状体との間及び／又は筒状体間に形成される空間が生じるので、この空間に冷媒を流通させる。単電池もしくは単電池の集合体からの放熱は、筒状体との間を流れる冷媒により直接的に冷却されるのと、熱伝導性のよい筒状体に伝熱した熱が筒状体の内外を流れる冷媒により間接的に冷却されるのと、２通りに行われることになる。筒状体は互いに連結されて全体としても放熱し、多数に形成された冷媒流路で冷却されるので、部分的な温度格差は抑制される。また、筒状体に、その内外を連通する開口部を要所に設けると、冷媒の流路が増し、冷媒の流速の変化も生じるので、より効果的な冷却を実施することができる。

【０００９】

【発明の実施の形態】以下、添付図面を参照して本発明の一実施形態について説明し、本発明の理解に供する。尚、以下の実施形態は本発明を具体化した一例であって、本発明の技術的範囲を限定するものではない。

【００１０】図１は、本実施形態に係る蓄電池電源装置１の構成を示す斜視図である。蓄電池２を挿入した筒状ケース（筒状体）３を４個連結した状態を示しているが、同じ構成を図示右方向及び下方向に連続して、所要数の蓄電池２を収容した筒状ケース３が連結される。又、ここで示す蓄電池２は、複数の単電池を直列接続した単電池の集合体として構成されている。電気的な接続構成は省略しているが、連結した蓄電池２、２……を接続することによって、所定の出力電圧と電力量が得られるよう構成される。

【００１１】図１において、蓄電池２は円柱形に形成されており、筒状ケース３は断面形状８角形の筒に形成されているので、筒状ケース３内に蓄電池２を挿入すると、蓄電池２は円周部の長さ方向の４箇所で筒状ケース３の内面に接し、その他の部分では筒状ケース３の内部に空間Ａを形成する。また、筒状ケース３、３……は互いに連結し合ったとき、角部に空間Ｂが形成される。こ

の空間Bは、蓄電池2を収容した筒状ケース3を複数個連結し、これを収納ケース4内に収めて蓄電池電源装置1を構成したとき、個々の筒状ケース3の角部にも形成させることができる。これらの空間A及び空間Bに冷媒としての空気を流通させることにより、効果的に冷却を行うことができる。

【0012】前記筒状ケース3は、アルミニウム等の熱伝導性のよい材料で形成されているので、蓄電池2から直接、間接的に熱を奪うと共に、連結された相互間で熱伝導させるので、蓄電池電源装置1として多数集積させたときにも、全体の温度の均一化を促進する。

【0013】また、筒状ケース3には、図1に示すように、通気孔（開口部）5を設けることができる。この通気孔5は、図示するように8角形に形成された筒状ケース3の空間Bに接する狭い辺の奥側に開設することにより、図1に示す蓄電池電源装置1の手前側を冷媒の入口に設定し、図2に示すように、奥側を遮蔽板6により空間Bに相当する位置の通気を遮蔽すると、空間Aを流通した空気は蓄電池2を冷却して奥側に抜け、空間Bから入った空気は前記通気孔5から空間Aに入って奥側に抜ける。蓄電池2は複数個の単電池を連結して構成されているので、空気流通の下流側は冷却効率が低下して温度上昇が大きくなるが、通気孔5から侵入する空気は下流側の単電池を冷却することになるので、冷却による温度の均一化を図ることができる。

【0014】尚、前記遮蔽板6は、図1に示すように筒状ケース3の一端に遮蔽板6を形成しておき、筒状ケース3を連結したとき、隣接間で互いに当接し、空間Bの冷媒流通の下流側を遮蔽する。この遮蔽板6は、所要数に集積される筒状ケース3に別途取り付けるようにしてもよい。

【0015】次に、筒状ケース3の連結構造について説明する。図3及び図4に連結構造の例を断面図として示す。

【0016】図3に示す連結構造は、8角形に形成された筒状ケース3aの2辺に凹部7、他の2辺に凸部8を形成し、隣り合う筒状ケース3aの凹部7と凸部8とを嵌め合わせることによって、筒状ケース3a、3a……が互いに連結される。

【0017】図4に示す連結構造は、8角形に形成された筒状ケース3bの4辺に全て凹部7を形成したもので、連結は別ピースとなる連結部材9の両端を隣り合う間の筒状ケース3b、3bの凹部7、7間に嵌め込むことによりなされる。この連結部材9は、同図（b）に示すように、長さを変えて連結間隔を変化できるように形成することができ、多数集積した筒状ケース3bの周囲に冷媒流通の空間を形成することもできる。

【0018】上記例に示したように、筒状ケース3は上下左右に自由に連結できるので、蓄電池電源装置1として所望される出力電圧、電力量に応じ、あるいは蓄電池電源装置1を搭載するスペースに応じて、自在に集積数を変化させ、集積形状を変化させることができる。図5は比較的小容量の蓄電池電源装置1を構成した例で、横並列に1段積みにした構成である。図6は縦横に4列づつに集積した例、図7は変形4段積みにした例である。このように、集積数や集積形状は自在に変化させ得るので、例えば、電気自動車の駆動電源として利用する場合のように、搭載スペースに制約を受ける場合でも、充分に対応させることができる。

【0019】尚、筒状ケース3は、以上説明したような8角形でなく、図8に示すように4角形に形成することも、あるいは、蓄電池2が円柱形状でなく角柱形状である場合には、円筒形に形成すれば、上記構成と同様に蓄電池2と筒状ケース3とを部分的に接触させ、周囲に冷媒通路を形成する形態を実現することができる。図8に示す4角形の筒に形成した筒状ケース3cの場合は、蓄電池2の周囲に冷媒通路を広く形成することができ、ここを流通させる冷媒により蓄電池2と筒状ケース3cとを冷却させることになる。また、集積した複数の筒状ケース3cを収納する収納ケースとの間に間隔を設けて、その間隔部分に冷媒を流通させることもできる。

【0020】以上説明した筒状ケース3、3a、3b、3cは、アルミニウム等の熱伝導性に優れた材料により形成されるので、収容した蓄電池2の発熱を奪い、相互間の熱伝導により外部に放熱するので、温度分布の均一化はより促進される。

【0021】

【実施例】図1に示す実施形態により単電池を6個直列接続した蓄電池2を42個集積した蓄電池電源装置1を構成し、図9に示す比較例とする蓄電池電源装置10とともに、使用時の温度分布について以下の検証を実施した。

【0022】比較例とする蓄電池電源装置10の概略構成を説明する。図9に示すように、本実施例と同様に、6個の単電池を直列接続した蓄電池2を横並列で5段積みにして42個を集積したもので、3mm厚のポリプロピレン製の蓄電池保持部材11で各積層段の蓄電池2を保持している。

【0023】温度分布測定の条件は、環境温度24℃で、各蓄電池電源装置1及び10の蓄電池群を1Ahで充電しながら、単電池の表面温度が50℃に達した時点でファンを作動させ、蓄電池2の長さ方向に3リットル／cm^2 の空気を流通させた。

【0024】温度測定は、ファン作動開始から2時間後の単電池の表面温度を測定した。測定は、集積された最外列より2層目の蓄電池列に対して実施し、長さ370mmの蓄電池2に対して、空気流通の上流端から50mm（点1）、170mm（点2）、260mm（点3）、及び340mm（点4）の各位置での温度を熱電対を用いて測定した。

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【００２５】上記温度分布測定結果は、表１及び図１０に示す通りである。

＊【００２６】

＊【表１】

	電池温度（℃）				
	点１	点２	点３	点４	温度差
実施例	３２．８	３５．７	３５．１	３６．９	４．１
比較例	３３．２	３７．９	４０．７	４２．３	９．１

【００２７】表１及び図１０からわかるように、比較例の蓄電池電源装置１０では、空気流通下流側の単電池の表面温度が４０℃を超え、上流下流間で約９℃の温度差が生じているのに対して、実施例の蓄電池電源装置１では、約４℃の温度差内にまで抑制されている。空気流通の最上流側の単電池の温度が低いのは当然のこととしても、下流側に至っても大きな温度上昇がなく、効果的に冷却がなされ、単電池間の温度差が少ないことが実証された。

【００２８】

【発明の効果】以上の説明の通り本発明によれば、断面外形形状が長さ方向に一定の柱状に形成された前記単電池もしくは単電池の集合体を、その外周面が部分的に内接する筒状体内に収容し、この筒状体を連結部により任意方向に連結すると、単電池もしくは単電池の集合体と筒状体との間及び／又は筒状体間に形成される空間が生じるので、この空間に冷媒を流通させる。単電池もしくは単電池の集合体からの放熱は、筒状体との間を流れる冷媒により直接的に冷却されるのと、熱伝導性のよい筒状体に伝熱した熱が筒状体の内外を流れる冷媒により間接的に冷却されるのと、２通りに行われることになる。筒状体は互いに連結されて全体としても放熱し、多数に形成された冷媒流路で冷却されるので、部分的な温度格差は抑制される。また、筒状体に、その内外を連通する開口部を要所に設けると、冷媒の流路が増し、冷媒の流速の変化も生じるので、より効果的な冷却を実施することができる。

【図面の簡単な説明】

※【図１】本発明の一実施形態に係る蓄電池電源装置の構成を示す斜視図である。

【図２】図１に示す構成の後方部分の構成例を説明する平面図である。

【図３】筒状ケースの連結構造の例を示す断面図である。

【図４】筒状ケースの連結構造の例を示す断面図（ａ）と連結部材の形状例を示す断面図（ｂ）である。

【図５】筒状ケースに収容した蓄電池の集積構造例を示す斜視図である。

【図６】筒状ケースに収容した蓄電池の集積構造例を示す斜視図である。

【図７】筒状ケースに収容した蓄電池の集積構造例を示す斜視図である。

【図８】筒状ケースの変形例を示す斜視図である。

【図９】温度分布測定の比較例とした蓄電池電源装置の構成を示す正面図である。

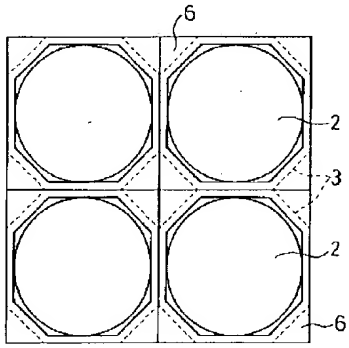
【図１０】温度分布測定の結果を示す温度グラフである。

【符号の説明】

１　蓄電池電源装置
２　蓄電池
３、３ａ、３ｂ　筒状ケース
５　通気孔
７　凹部
８　凸部
Ａ、Ｂ　冷媒流通空間

※

【図２】



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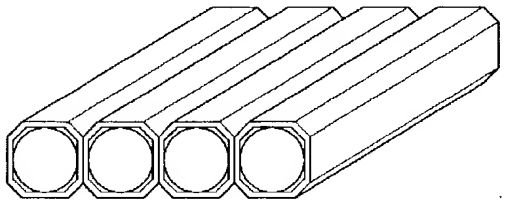
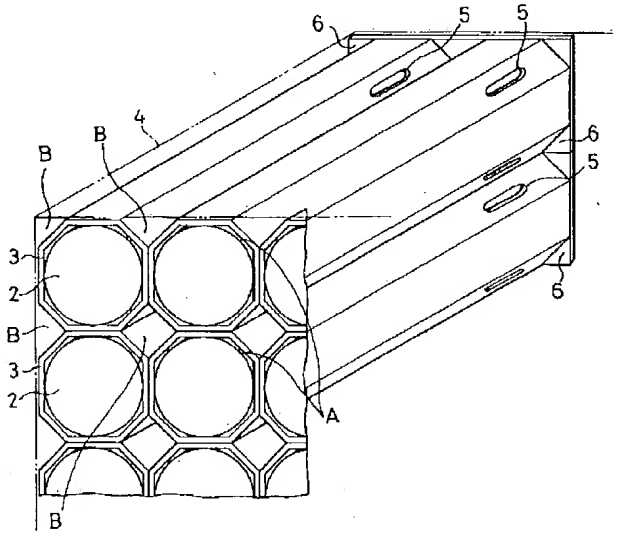


【図1】



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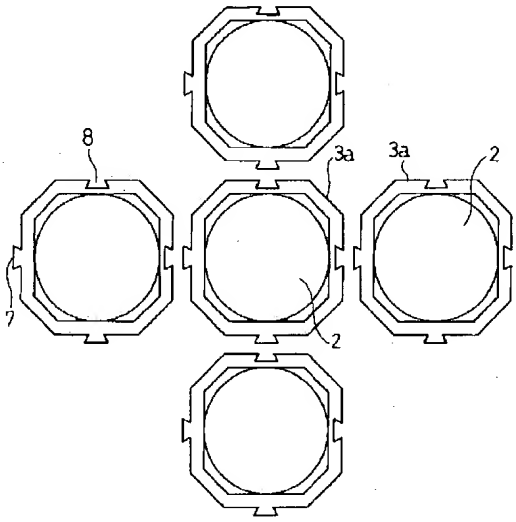

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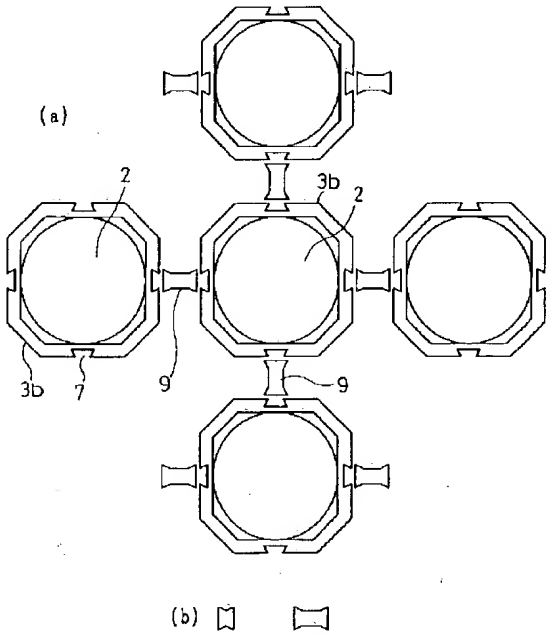

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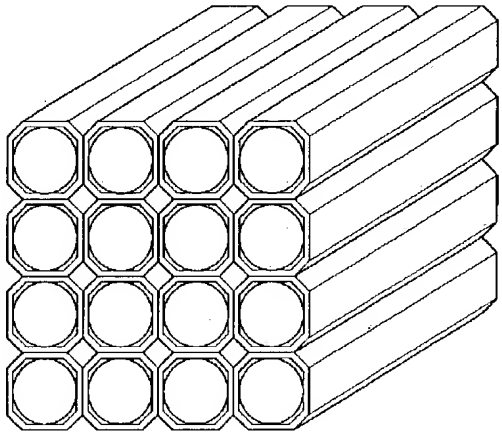

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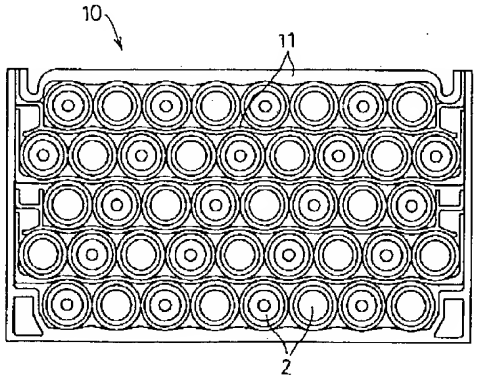

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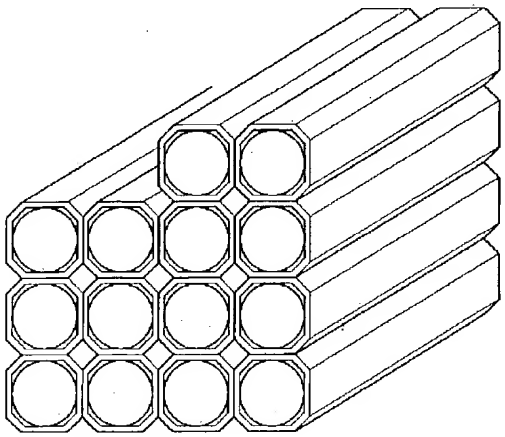

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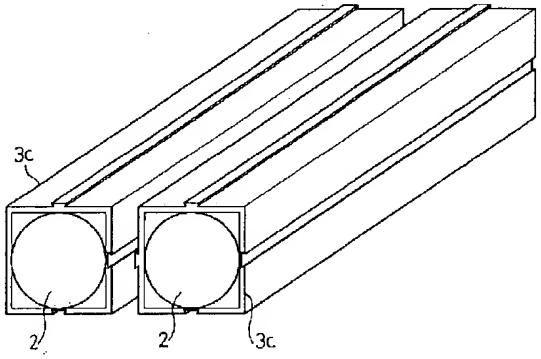
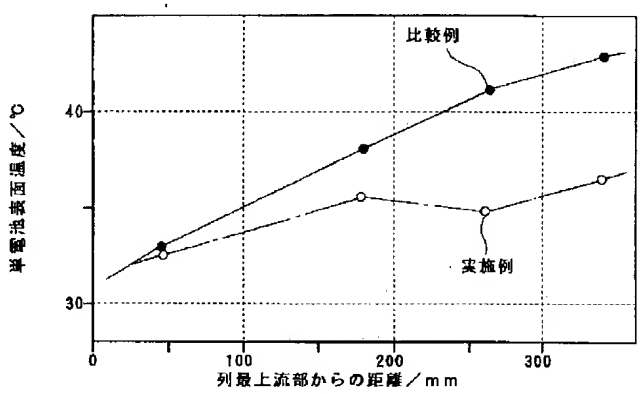


【図１０】



フロントページの続き

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the battery power unit equipped with the heat dissipation structure of suppressing the temperature rise of the battery used as especially the aggregate, about the battery power unit which acquires predetermined electric energy combining two or more cells.
[0002]
[Description of the Prior Art] Since high density arrangement of many cells will be carried out when many cells are connected and the battery power unit of a predetermined electrical potential difference and predetermined electric energy is constituted, a power unit carries out a temperature rise with generation of heat, the Joule's heat, etc. of each cell. Then, refrigerants, such as air, were circulated between the arrays of a cell and controlling the temperature rise of a cell has been carried out from the former.
[0003]
[Problem(s) to be Solved by the Invention] However, when circulating a refrigerant between the cells arranged at two or more trains, since it will be cooled with the refrigerant which carried out the temperature rise by the cell of the upstream, the cell located in the downstream of the refrigerant negotiation direction has low cooling effectiveness, and the temperature of the cell of the downstream becomes high compared with the cell of the upstream. Moreover, the degree in which the cell located in the accumulated center section receives the heat transfer from a surrounding cell is large, and a temperature rise becomes intense.
[0004] Thus, when the temperature gap between the accumulated cells becomes large, it is easy to produce a gap also for the cell engine performance, a failure is also brought to charge-and-discharge control, and the dependability as a battery power unit is made to fall.
[0005] This invention aims at offering the battery power unit equipped with the heat dissipation structure which raises the accumulated heat dissipation nature of cell each that the degradation of the battery power unit accompanying dispersion in the heat dissipation nature like the above should be controlled.
[0006]
[Means for Solving the Problem] In the battery power unit which the battery power unit concerning this invention carries out required-number accumulation of the aggregate of a cell or a cell, and acquires predetermined electric energy While holding the aggregate of said cell with which the cross-section appearance configuration was formed in the die-length direction in the shape of [fixed] a column, or a cell in the tube-like object with which that peripheral face is selectively inscribed in and connecting this tube-like object in the direction of arbitration It is characterized by carrying out the forcible negotiation of the refrigerant in the space produced when the space and/or the tube-like object which are formed in said tube-like object are made to connect mutually.
[0007] The connection section made to connect mutually is formed outside, opening which opens the interior and the exterior for free passage is formed in an arbitration location, and the above-mentioned tube-like object can be formed with the ingredient excellent in thermal conductivity.
[0008] If according to the above-mentioned configuration the aggregate of said cell with which the cross-section appearance configuration was formed in the die-length direction in the shape of [fixed] a column, or a cell is held in the tube-like object with which that peripheral face is selectively inscribed in and this tube-like object is connected in the direction of arbitration by the connection section, since the space formed between the aggregate of a cell or a cell and a tube-like object and/or between tube-like objects will be generated, a refrigerant is circulated to this space. Heat dissipation from the aggregate of a cell or a cell will be performed to two kinds with being directly cooled with the refrigerant which flows between tube-like objects, and being indirectly cooled with the refrigerant with which the heat which carried out heat transfer to the thermally conductive good tube-like object flows the inside and outside of a tube-like object. The tube-like object of each other is connected and heat is radiated also as the whole, and since it is cooled in the refrigerant passage formed in a large number, a partial temperature gap is controlled. Moreover, if opening which opens the inside and outside for free passage to a tube-like object is prepared in the key point, since the passage of a refrigerant will also produce change of increase and the rate of flow of a refrigerant, more effective cooling can be carried out.
[0009]
[Embodiment of the Invention] Hereafter, 1 operation gestalt of this invention is explained with reference to an accompanying

drawing, and an understanding of this invention is presented. In addition, the following operation gestalten are examples which materialized this invention, and do not limit the technical range of this invention.

[0010] Drawing 1 is the perspective view showing the configuration of the battery power unit 1 concerning this operation gestalt. Although the condition of having connected four tubed cases (tube-like object) 3 which inserted the battery 2 is shown, the graphic display right and down are followed in the same configuration, and the tubed case 3 which held the battery 2 of a required number is connected. Moreover, the battery 2 shown here is constituted as the aggregate of the cell which carried out the series connection of two or more cells. Although the electric connection configuration is omitted, it is constituted by connecting the connected battery 2 and 2 .... so that predetermined output voltage and electric energy may be acquired.

[0011] In drawing 1 , since the battery 2 is formed in the cylindrical shape and the tubed case 3 is formed in the cylinder of cross-section configuration 8 square shape, if a battery 2 is inserted into the tubed case 3, a battery 2 will touch the inner surface of the tubed case 3 by four places of the die-length direction of the periphery section, and will form Space A in the interior of the tubed case 3 in other parts. Moreover, Space B is formed in a corner when connecting the tubed case 3 and 3 .... mutually. This space B connects two or more tubed cases 3 which held the battery 2, and when it stores this in the receipt case 4 and constitutes the battery power unit 1, it can be made to form them also in the corner of each tubed case 3. By circulating the air as a refrigerant to such space A and Space B, it can cool effectively.

[0012] Since heat conduction of it is carried out by the connected mutual while it takes heat from a battery 2 directly and indirectly, since said tubed case 3 is formed with thermally conductive good ingredients, such as aluminum, also when a large number are made accumulated as a battery power unit 1, it promotes equalization of the whole temperature.

[0013] Moreover, as shown in the tubed case 3 at drawing 1 , an air hole (opening) 5 can be formed. This air hole 5 by establishing to the back side of the narrow side adjacent to the space B of the tubed case 3 formed in eight square shapes so that it might illustrate As the near side of the battery power unit 1 shown in drawing 1 is set as the inlet port of a refrigerant and it is shown in drawing 2 If the aeration of the location which is equivalent to Space B in a back side with a shield 6 is covered, the air which circulated Space A will cool a battery 2, and will escape from it to a back side, and the air which entered from Space B will escape from close from said air hole 5 to Space A at a back side. Since a battery 2 connects two or more cells and is constituted, as for the downstream of an air negotiation, a temperature rise becomes large by cooling effectiveness falling, but since the air which invades from an air hole 5 will cool the cell of the downstream, equalization of the temperature by cooling can be attained.

[0014] In addition, when the shield 6 is formed in the end of the tubed case 3 as shown in drawing 1 , and the tubed case 3 is connected, said shield 6 is between contiguity, contacts mutually, and covers the downstream of a refrigerant negotiation of Space B. You may make it attach this shield 6 in the tubed case 3 accumulated on a required number separately.

[0015] Next, the connection structure of the tubed case 3 is explained. The example of connection structure is shown in drawing 3 and drawing 4 as a sectional view.

[0016] Tubed case 3a and 3a.... is mutually connected by the connection structure shown in drawing 3 forming a crevice 7 in two sides of tubed case 3a formed in eight square shapes, forming heights 8 in other two sides, and inserting in the adjacent crevice 7 and the heights 8 of tubed case 3a.

[0017] The connection structure shown in drawing 4 is what formed the crevice 7 in four sides of tubed case 3b formed in eight square shapes altogether, and connection is made by inserting in between the crevice 7 of the tubed cases 3b and 3b while adjoining each other in the ends of the connection member 9 used as another piece, and 7. As shown in this drawing (b), this connection member 9 can change die length, it can form it so that the coupling interval can be changed, and can also form the space of a refrigerant negotiation in the perimeter of tubed case 3b which carried out a large number accumulation.

[0018] Since the tubed case 3 can be freely connected vertically and horizontally as shown in the above-mentioned example, corresponding to the output voltage and electric energy for which it asks as a battery power unit 1, according to the tooth space in which the battery power unit 1 is carried, the number of accumulation can be changed free and an accumulation configuration can be changed. Drawing 5 is the example which constituted the battery power unit 1 of small capacity comparatively, and is the configuration carried out to horizontal juxtaposition at 1 tiering. The example which accumulated drawing 6 at a time on four trains in all directions, and drawing 7 are the examples made deformation 4 tiering. Thus, for example, even when receiving constraint in a loading tooth space, it can be made to fully correspond like [in the case of using as an actuation power source of an electric vehicle], since the number of accumulation and an accumulation configuration may be changed free.

[0019] In addition, forming in four square shapes, as shown in drawing 8 instead of eight square shapes which were explained above forms in a cylindrical shape, when a battery 2 is the shape not of a cylindrical shape but a prism configuration, and it can contact a battery 2 and the tubed case 3 selectively like the above-mentioned configuration, and the tubed case 3 can realize the gestalt which forms a refrigerant path in a perimeter. In tubed case 3c formed in the cylinder of four square shapes shown in drawing 8 , a refrigerant path can be widely formed in the perimeter of a battery 2, and a battery 2 and tubed case 3c are made cooled with the refrigerant which circulates this. Moreover, spacing can be prepared between the receipt cases which contain two or more accumulated tubed case 3c, and a refrigerant can also be circulated into the spacing part.

[0020] Since generation of heat of the battery 2 held since the tubed cases 3, 3a, 3b, and 3c explained above were formed with the ingredient excellent in thermal conductivity, such as aluminum, is taken and heat is radiated outside by mutual heat conduction, equalization of temperature distribution is promoted more.

[0021]

[Example] The battery power unit 1 which accumulated 42 batteries 2 which carried out the six-piece series connection of the cell according to the operation gestalt shown in drawing 1 was constituted, and the following verification was carried out about the temperature distribution at the time of an activity with the battery power unit 10 made into the example of a comparison shown in drawing 9 .

[0022] The outline configuration of the battery power unit 10 made into the example of a comparison is explained. As shown in drawing 9 , it is what made 5 tiering the battery 2 which carried out the series connection of the six cells by horizontal juxtaposition like this example, and accumulated 42 pieces, and the battery 2 of each laminating stage is held by the battery attachment component 11 made from the polypropylene of 3mm thickness.

[0023] It is 24 degrees C in environmental temperature, when the skin temperature of a cell amounts to 50 degrees C, charging the battery group of each battery power units 1 and 10 by 1Ah, a fan is operated, and the conditions of temperature-distribution measurement are 2 3l./cm to the die-length direction of a battery 2. Air was circulated.

[0024] The thermometry measured the skin temperature of the cell 2 hours after fan actuation initiation. Measurement was carried out from the accumulated outermost train to the battery train of a two-layer eye, and measured with a location [each] (50mm (point 1), 170mm (point 2), 260mm (point 3), and 340mm (point 4)) temperature from the upper edge of an air negotiation to the battery 2 with a die length of 370mm using the thermocouple.

[0025] The above-mentioned temperature-distribution measurement result is as being shown in a table 1 and drawing 10 .

[0026]

[A table 1]

	電池温度 (℃)				
	点1	点2	点3	点4	温度差
実施例	32. 8	35. 7	35. 1	36. 9	4. 1
比較例	33. 2	37. 9	40. 7	42. 3	9. 1

[0027] In the battery power unit 10 of the example of a comparison, the skin temperature of the cell of the air negotiation downstream exceeds 40 degrees C, and it is controlled even in about 4-degree C temperature gradient with the battery power unit 1 of an example to about 9-degree C temperature gradient having arisen between upper lower streams of rivers so that a table 1 and drawing 10 may show. It did not have a big temperature rise that the temperature of the cell of the maximum upstream of an air negotiation is low, even if it resulted in the downstream also as a matter of course, cooling was made effectively, and it was proved that there were few temperature gradients between cells.

[0028]

[Effect of the Invention] If the aggregate of said cell with which the cross-section appearance configuration was formed in the die-length direction in the shape of [fixed] a column, or a cell is held in the tube-like object with which that peripheral face is selectively inscribed in and this tube-like object is connected in the direction of arbitration by the connection section, since the space formed between the aggregate of a cell or a cell and a tube-like object and/or between tube-like objects will be generated as the above explanation according to this invention, a refrigerant is circulated to this space. Heat dissipation from the aggregate of a cell or a cell will be performed to two kinds with being directly cooled with the refrigerant which flows between tube-like objects, and being indirectly cooled with the refrigerant with which the heat which carried out heat transfer to the thermally conductive good tube-like object flows the inside and outside of a tube-like object. The tube-like object of each other is connected and heat is radiated also as the whole, and since it is cooled in the refrigerant passage formed in a large number, a partial temperature gap is controlled. Moreover, if opening which opens the inside and outside for free passage to a tube-like object is prepared in the key point, since the passage of a refrigerant will also produce change of increase and the rate of flow of a refrigerant, more effective cooling can be carried out.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the perspective view showing the configuration of the battery power unit concerning 1 operation gestalt of this invention.
[Drawing 2] It is a top view explaining the example of a configuration of the back part of a configuration of being shown in drawing 1 .
[Drawing 3] It is the sectional view showing the example of the connection structure of a tubed case.
[Drawing 4] They are the sectional view (a) showing the example of the connection structure of a tubed case, and the sectional view (b) showing the example of a configuration of a connection member.
[Drawing 5] It is the perspective view showing the example of accumulation structure of the battery held in the tubed case.
[Drawing 6] It is the perspective view showing the example of accumulation structure of the battery held in the tubed case.
[Drawing 7] It is the perspective view showing the example of accumulation structure of the battery held in the tubed case.
[Drawing 8] It is the perspective view showing the modification of a tubed case.
[Drawing 9] It is the front view showing the configuration of a battery power unit made into the example of a comparison of temperature-distribution measurement.
[Drawing 10] It is the temperature graph which shows the result of temperature-distribution measurement.
[Description of Notations]
1 Battery Power Unit
2 Battery
3, 3a, 3b Tubed case
5 Air Hole
7 Crevice
8 Heights
A, B Refrigerant negotiation space

[Translation done.]

CLAIMS

[Claim(s)]
[Claim 1] In the battery power unit which carries out required-number accumulation of the aggregate of a cell or a cell, and acquires predetermined electric energy While holding the aggregate of said cell with which the cross-section appearance configuration was formed in the die-length direction in the shape of [fixed] a column, or a cell in the tube-like object with which that peripheral face is selectively inscribed in and connecting this tube-like object in the direction of arbitration The battery power unit characterized by carrying out the forcible negotiation of the refrigerant in the space produced when the space and/or the tube-like object which are formed in said tube-like object are made to connect mutually.
[Claim 2] The battery power unit according to claim 1 characterized by forming in the outside surface of a tube-like object the connection section which makes a tube-like object connect mutually.
[Claim 3] The battery power unit according to claim 1 characterized by forming in the arbitration location of a tube-like object opening which opens the interior and the exterior for free passage.
[Claim 4] The battery power unit according to claim 1 characterized by coming to form a tube-like object with the ingredient excellent in thermal conductivity.

[Translation done.]

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DOCUMENT-IDENTIFIER: JP 10106520 A

TITLE: STORAGE BATTERY POWER SUPPLY DEVICE

PUBN-DATE: April 24, 1998

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APPL-NO: JP08254242

APPL-DATE: September 26, 1996

INT-CL (IPC): H01M002/10, H01M010/50

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a storage battery power supply device which permits establishing a uniform temp. distribution by suppressing a temp. rise in the case the storage battery power supply device consists of a stack of a plurality of storage batteries for a certain specific power quantity.

SOLUTION: Each storage battery 2 formed in a circular column is accommodated in a case 3 formed in an octangular cylinder, and a specified number of such cylindrical cases 3 are coupled together so that an

intended storage battery
power supply device is accomplished. A coolant flow space A is formed between
each battery 2 and case 3 and a coolant flow space B is formed at the angles of
each cylindrical case 3, and therefore, if a coolant is sent flowing there, the
heat emitted by the batteries 2 is conducted from the contacting parts to the
cases 3, and the batteries 2 and cases 3 are cooled by the coolant. A vent 5
is furnished understream the coolant flow path in each case 3, and if the side
understream of the space B is held shut, the coolant flows into the cases 3
from the vents 5, so that cooling of the batteries 2 positioned understream is
promoted.